PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-208178

(43)Date of publication of application : 28.07.2000

(51)Int.Cl. H01R 11/01
G02F 1/1345
H01R 43/00
H05K 1/14

(21)Application number : 11-011623

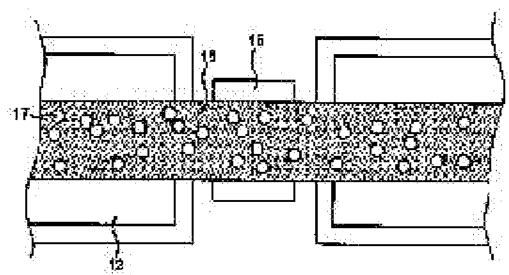
(22)Date of filing : 20.01.1999

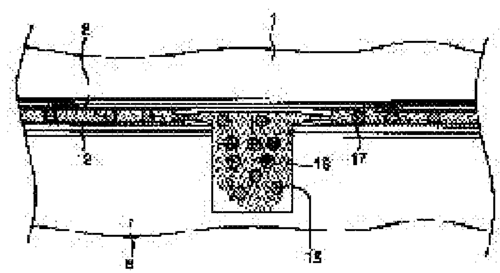
(71)Applicant : MITSUBISHI ELECTRIC CORP

(72)Inventor : KUBOTA TAKESHI

(54) SEMICONDUCTOR APPLICATION DEVICE AND ITS PRODUCTION

(57)Abstract:





PROBLEM TO BE SOLVED: To ensure the space between first and second substrates in a groove part between mutually adjacent first terminal electrodes larger than the space between mutually opposed first and second terminal electrodes and satisfactorily keep the insulating property of an anisotropic conductive film between the adjacent first terminal electrodes at low cost by forming each groove between the first terminal electrodes of a first substrate.

SOLUTION: A strip anisotropic conductive film 16 is arranged across a groove 15 on a terminal electrode 12, and the terminal electrode 2 of a liquid crystal panel is opposed and bonded to the terminal electrode 12 of a drive circuit substrate through the anisotropic conductive film 16. As a conductive particle 17 included in the anisotropic conductive film 16, those having a diameter of 2-3 μm are used, the depth of the groove 15 is set to 20 μm, and the terminal electrodes 2, 12 are conducted through the conductive particle 17. The state where the conductive particles 17 are present separately by the groove 15 can be kept between the adjacent terminal electrodes 2, 12, and a satisfactory insulated state can be thus kept. Accordingly, the space between the terminal electrodes can be reduced at a low cost to miniaturize the device.

CLAIMS

[Claim(s)]
[Claim 1]It has the 2nd substrate that has two or more 2nd terminal electrodes formed so that it might correspond to the 1st substrate and 1st terminal electrode of the above that have two or more 1st terminal electrodes, respectively, A semiconductor applied device which is a semiconductor applied device which the 1st terminal electrode of the above and the 2nd terminal electrode of the above are made to counter via an anisotropic conducting film, and is joined, and is characterized by forming a slot between the 1st terminal electrode of the above in the 1st substrate of the above, respectively.
[Claim 2]The semiconductor applied device according to claim 1 whose interval between terminal electrodes of the above 1st is 50 micrometers or less.
[Claim 3]The semiconductor applied device according to claim 1 or 2 whose terminal number of the 1st terminal electrode of the above is 100 or more.
[Claim 4]A semiconductor applied device given in any 1 paragraph of the claims 1-3 whose thickness of the 1st and 2nd terminal electrodes of the above is 1 micrometer or less, respectively.
[Claim 5]A semiconductor applied device given in any 1 paragraph of the claims 1-4 which the above-mentioned anisotropic conducting film made the above-mentioned tooth depth larger than a path of the above-mentioned electric conduction particles including electric conduction particles, and made width of the above-mentioned slot more than twice the above-mentioned electric conduction particle diameter.
[Claim 6]A semiconductor applied device given in any 1 paragraph of the claims 1-4 which set the above-mentioned tooth depth and width to not less than 5 micrometers.
[Claim 7]A semiconductor applied device given in any 1 paragraph of the claims 1-6 which used at least one side of the 1st or 2nd substrate of the above as a transparent insulating substrate.

[Claim 8]In a portion which the 1st substrate of the above and the 2nd substrate of the above counter, into and at least a part of portion in which the above-mentioned anisotropic conducting film is not formed. A semiconductor applied device given in any 1 paragraph of the claims 1-7 in which a resin layer which has the substantially same size as electric conduction particles contained in the above-mentioned anisotropic conducting film, and contains a non-conducting spacer was formed.
[Claim 9]A semiconductor applied device given in any 1 paragraph of the claims 1-4 which the 1st terminal electrode of the above is formed on a substrate of the above 1st via an insulator layer which has a thickness of 1 micrometers or more, and are formed by removing an insulator layer in which the above-mentioned slot is located between the 1st terminal electrode of the above.
[Claim 10]A semiconductor applied device given in any 1 paragraph of the claims 1-9 whose either is silicon substrates among the above 1st and the 2nd substrate.
[Claim 11]The 2nd substrate that has two or more 2nd terminal electrodes formed so that it might correspond to the 1st substrate and 1st terminal electrode of the above that have two or more 1st terminal electrodes, It is a manufacturing method of a semiconductor applied device including a joining process which the 1st terminal electrode of the above and the 2nd terminal electrode of the above are made to counter via an anisotropic conducting film, and is joined, A manufacturing method of a semiconductor applied device including a groove formation process of forming a slot between the 1st terminal electrode of the above in the 1st substrate of the above before the above-mentioned joining process.
[Claim 12]A manufacturing method of the semiconductor applied device according to claim 11 the 1st substrate of the above being a substrate which consists of glass, quartz, or silicon, and including an etching process which etches the 1st substrate of the above using a solution in which the above-mentioned groove formation process contains fluoric acid.
[Claim 13]A manufacturing method of the semiconductor applied device according to claim 11 with which the 1st substrate of the above is a substrate which consists of glass, quartz, or silicon, and the above-mentioned groove formation process includes a process of etching the 1st substrate of the above by dry etching.
[Claim 14]It comes to form the 1st terminal electrode of the above on a substrate of the above 1st via an insulator layer which has a thickness of 1 micrometers or more, A manufacturing method of the semiconductor applied device according to claim 11 which is the process of forming a slot when the above-mentioned groove formation process etches and removes the above-mentioned insulator layer located between terminal electrodes of the above 1st.
[Claim 15]A manufacturing method of the semiconductor applied device according to claim 14 including carrying out exposure development of the above-mentioned insulator layer in which the above-mentioned insulator layer is formed with a photopolymer, and the above-mentioned

******** consists of the above-mentioned photopolymer.

[Claim 16]In [after the 1st terminal electrode of the above forms an electrode layer for forming this 1st terminal electrode, it is formed by forming a mask for electrode formation of predetermined shape on this electrode layer, and etching the above-mentioned electrode layer, and] the above-mentioned groove formation process, A manufacturing method of the semiconductor applied device according to claim 11 which forms the above-mentioned slot by etching between terminal electrodes of the above 1st using the above-mentioned mask for electrode formation.

[Claim 17]A manufacturing method of the semiconductor applied device according to claim 11 forming resist in portions other than the above-mentioned slot, and forming a slot by etching this resist as a mask in the above-mentioned groove formation process.

[Claim 18]A manufacturing method of the semiconductor applied device according to claim 11 forming a slot by etching the 1st terminal electrode of the above as a mask in the above-mentioned groove formation process.

[Claim 19]The 2nd substrate that has two or more 2nd terminal electrodes formed so that it might correspond to the 1st substrate and 1st terminal electrode of the above characterized by comprising the following that have two or more 1st terminal electrodes, A manufacturing method of a semiconductor applied device including a process which the 1st terminal electrode of the above and the 2nd terminal electrode of the above are made to counter via an anisotropic conducting film, and is joined.

A protection film formation process which forms a protective film which continued between terminal electrodes of this above 1st on a terminal conductor of the above 1st.

A resist formation process of forming resist of predetermined shape which has the 1st opening on a terminal electrode of the above 1st, and has the 2nd opening between terminal electrodes of the above 1st on the above-mentioned protective film.

An etching process which forms a contact hole on a terminal electrode of the above 1st, removes the above-mentioned protective film via the 2nd opening of the above, and forms a slot between terminal electrodes of the above 1st by removing the above-mentioned protective film via the 1st opening of the above.

[Claim 20]The above-mentioned manufacturing method includes a process of providing further an anisotropic conducting film which followed the 1st terminal electrode of the above, and above-mentioned Mizogami in the 1st substrate of the above, A manufacturing method of a semiconductor applied device given in any 1 paragraph of the claims 11-19 which connected the 1st terminal electrode of the above, and the 2nd terminal electrode of the above via this anisotropic conducting film.

[Claim 21]A resin layer which has the substantially still more nearly same size as electric

conduction particles contained in the above-mentioned anisotropic conducting film in the above-mentioned manufacturing method, and contains a non-conducting spacer particle, A manufacturing method of a semiconductor applied device given in any 1 paragraph of the claims 11-20 including a process formed in a portion in which the above-mentioned anisotropic conducting film is not formed.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the manufacturing method of the semiconductor applied device represented by the liquid crystal display etc. in which the semiconductor device was mounted.
[0002]
[Description of the Prior Art]In recent years, it integrates highly dramatically, and a semiconductor device becomes small, and contributes to space-saving-ization of a semiconductor applied device. However, since the mounting technology of a semiconductor device serves as a neck as a semiconductor applied device and the space of a mounted part is not made small enough, the actual condition is being unable to utilize the miniaturization of a semiconductor device thoroughly enough. Development of the component engineering for mounting a semiconductor device in a product directly is actively performed towards cost reduction and space-saving-izing under such a situation. The COG (chip on glass) method (Kazunari Tanaka Institute of Image Information and Television Engineers technical report January, 1998 IDY98-40 p81-86) especially for mounting a semiconductor device in a glass substrate directly with a liquid crystal display, and the semiconductor device on glass, GOG (glass on glass) mounted in the terminal on glass -- development of law etc. progresses and it is coming. However, also about these, it becomes difficult as terminal intervals become narrow, and there is still much SUBJECT.
[0003]In such mounting technology, an anisotropic conducting film (ACFAnisotropic Conductive Film) is usually used for connection between terminals in many cases. The connection by this anisotropic conducting film is used for usually mounting FPC (Flexible Printed Circuit), TCP (Tape Carrier Package), etc. in the terminal on a glass substrate. In mounting using this anisotropic conducting film, as it is indicated in drawing 22 as the terminal

electrode 103a formed in the substrate on the other hand, and the terminal electrode 103b formed in the substrate of another side, it is connected. Namely, between the terminal electrode 103a and the terminal electrode 103b which counter. As it becomes narrower than the path of the electric conduction particles 102 in the anisotropic conducting film 101 about the interval, crush the electric conduction particles 102, and a flow is aimed at, Between the adjacent terminal electrodes 103a and between the terminal electrodes 103b, as the interval became large compared with the path of the electric conduction particles 102, as the conductor particles 102 did not contact mutually, they have insulated.
[0004]Thus, in the mounting method which uses an anisotropic conducting film. The thickness of the terminal electrode 103a and the terminal electrode 103b which counter is used, The flow between terminals was obtained via the electric conduction particles 102 in the anisotropic conducting film 101 inserted between the terminal, and between the adjacent terminal electrodes 103a and between the terminal electrodes 103b, it separates mutually, and as the conductor particles 102 existed, they have insulated.
[0005]However, in GOG art, the thickness of the terminal electrode 103a and the b itself is as thin as about 100-500 nm, It is difficult to acquire the good contact between terminal electrodes using the connection principle by the anisotropic conducting film which it may be formed so that a terminal electrode part may occasionally become lower than the surroundings, and was explained using drawing 22. For example, in GOG mounting, when anisotropic conducting film 101 grade is used. As shown in drawing 23 (a) and drawing 23 (b), the electric conduction particles 102 may be crushed by the both sides between the terminal electrode 103a which counters, and 103b, and between the adjoining terminal electrodes 103b, and it may connect too hastily between the terminal electrodes which should be insulated. The probability which short-circuits by the electric conduction particles 102 becomes high as the interval between adjoining terminal electrodes becomes narrow.
[0006]Then, various methods are proposed in order to improve the above-mentioned problem in GOG mounting. Drawing 24 (a) and drawing 24 (b) show the method using the vamp 105 which is the example. For example, the wire bonder used for mounting of a semiconductor device is used, and the vamp 105 is formed in all the terminal electrodes 103a, and he crushes the electric conduction particles 102 located between them, and is trying to contact by narrowing between the vamp 105 and the terminal electrodes 103b in this method. There is also a method of using plating etc. in formation of the vamp 105. Or methods, such as performing phototype process so that electric conduction particles may remain only on a terminal electrode, are also devised. The mimetic diagram of the whole liquid crystal display which used the COG method and the GOG method, respectively is shown in drawing 25 (a) and (b). Some of ICs, power supply wiring, etc. are mounted by FPC or TCP.
[0007]

[Problem(s) to be Solved by the Invention]However, in the method of mounting by forming a vamp, since the vamp was formed, there was a problem that slimming down was difficult. In the case of the semiconductor device for the very large liquid crystal drives of the number of mounting terminals, the cost per one panel went up, and the method of using a wire bonder in the GOG method had the problem that a throughput got worse. Since there was a limit in making a vamp small, densification had a limit. If the size of a semiconductor device becomes large above to some extent in the method of forming a vamp using plating as shown in drawing 26 (a) and drawing 26 (b), When it was going to form in thickness required as the vamp 105, since thickness became uneven, power was not uniformly applied to the anisotropic conducting film 101, but there was a problem that defective continuity occurred by a place. When phototype process was used and the distance between terminals approached, there was a problem that electric conduction particles remained also between terminals and a defect occurred, only by phenomenon processing. For this reason, it was difficult to mount with high density enough.

[0008]Then, a problem is solved as mentioned above and an object of this invention is to provide the small thin semiconductor applied device in the conventional mounting method which is a high throughput and can be manufactured cheaply, and its manufacturing method.

[0009]

[Means for Solving the Problem]This invention is made in order to attain the above-mentioned purpose. Namely, a semiconductor applied device concerning this invention is provided with the 2nd substrate that has two or more 2nd terminal electrodes formed so that it might correspond to the 1st substrate and 1st terminal electrode of the above that have two or more 1st terminal electrodes, respectively, It is a semiconductor applied device which the 1st terminal electrode of the above and the 2nd terminal electrode of the above are made to counter via an anisotropic conducting film, and is joined, and a slot is formed between the 1st terminal electrode of the above in the 1st substrate of the above, respectively. If it does in this way, from an interval of the 1st terminal electrode of the above and the 2nd terminal electrode of the above which counter mutually. An interval of the 1st substrate of the above and the 2nd substrate of the above in a part for a slot between the 1st terminal electrode of the above that adjoins mutually can be enlarged, and the insulating property of the above-mentioned anisotropic conducting film located between the 1st terminal electrode of the above that adjoins mutually (the 2nd inter-electrode of the above that adjoins mutually) can be held good.

[0010]In order to make connection between wiring density and a high-density terminal in a semiconductor applied device concerning this invention, it is good as for 50 micrometers or less in an interval between terminal electrodes of the above 1st.

[0011]In a semiconductor applied device concerning this invention, it is good as for 100 or more in a terminal number of the 1st terminal electrode of the above.

[0012]In order to make variation in thickness of a terminal electrode small in a semiconductor applied device concerning this invention, it is preferred that thickness of the 1st and 2nd terminal electrodes of the above shall be 1 micrometer or less, respectively.
[0013]In order to hold more the insulating property of the above-mentioned anisotropic conducting film located in a semiconductor applied device concerning this invention between the 1st terminal electrode of the above that adjoins mutually (the 2nd inter-electrode of the above that adjoins mutually) to fitness, It is preferred to make the above-mentioned tooth depth larger than a path of electric conduction particles contained in the above-mentioned anisotropic conducting film, and to make width of the above-mentioned slot into more than twice the above-mentioned electric conduction particle diameter.
[0014]In a semiconductor applied device concerning this invention, it is good also considering the above-mentioned tooth depth and width as not less than 5 micrometers. When are done in this way and an anisotropic conducting film in which the 2-3-micrometer electric conduction particle generally used is contained is used, the insulating property of the above-mentioned anisotropic conducting film located between the 1st terminal electrode of the above that adjoins mutually (the 2nd inter-electrode of the above that adjoins mutually) can be held good.
[0015]In a semiconductor applied device concerning this invention, at least one side of the 1st or 2nd substrate of the above can be used as a transparent insulating substrate. Therefore, for example, it is applicable to displays, such as a liquid crystal display panel.
[0016]In a semiconductor applied device concerning this invention, In a portion which the 1st substrate of the above and the 2nd substrate of the above counter, into and at least a part of portion in which the above-mentioned anisotropic conducting film is not formed. It is preferred to form a resin layer which has the substantially same size as electric conduction particles contained in the above-mentioned anisotropic conducting film, and contains a non-conducting spacer, and it can make parallel substantially the 1st substrate of the above, and the 2nd substrate of each other of the above by this.
[0017]When the 1st terminal electrode of the above is formed on a substrate of the above 1st via an insulator layer which has a thickness of 1 micrometers or more, it may be made to form in a semiconductor applied device concerning this invention by removing an insulator layer located between the 1st terminal electrode of the above in the above-mentioned slot. If it does in this way, formation of a slot can be performed comparatively easily.
[0018]In a semiconductor applied device concerning this invention, either can be used as a silicon substrate among the above 1st and the 2nd substrate.
[0019]The 1st manufacturing method of a semiconductor applied device concerning this invention, The 2nd substrate that has two or more 2nd terminal electrodes formed so that it might correspond to the 1st substrate and 1st terminal electrode of the above that have two or more 1st terminal electrodes, A groove formation process of being a manufacturing method of

a semiconductor applied device including a joining process which the 1st terminal electrode of the above and the 2nd terminal electrode of the above are made countering via an anisotropic conducting film, and is joined, and forming a slot between the 1st terminal electrode of the above in the 1st substrate of the above before the above-mentioned joining process is included. If it does in this way, a semiconductor applied device with which a slot was formed between the 1st terminal electrode of the above that adjoins mutually in the 1st substrate of the above can be manufactured.

[0020]In the 1st manufacturing method of a semiconductor applied device concerning this invention, the 1st substrate of the above with a substrate which consists of glass, quartz, or silicon to a ** case. When the above-mentioned groove formation process includes an etching process which etches the 1st substrate of the above using a solution containing fluoric acid, a slot can be formed easily.

[0021]When the 1st substrate of the above is a substrate which consists of glass, quartz, or silicon, it may be made for the above-mentioned groove formation process to form the above-mentioned slot in the 1st manufacturing method of a semiconductor applied device concerning this invention including a process of etching the 1st substrate of the above by dry etching. If it does in this way, a slot of predetermined shape can be formed with sufficient accuracy.

[0022]When the 1st terminal electrode of the above is formed in the 1st manufacturing method of a semiconductor applied device concerning this invention via an insulator layer which has a thickness of 1 micrometers or more on a substrate of the above 1st, The above-mentioned groove formation process may be a process of forming a slot, by etching and removing the above-mentioned insulator layer located between terminal electrodes of the above 1st. If it does in this way, a slot can be formed comparatively easily.

[0023]The above-mentioned insulator layer forms with a photopolymer, and it may be made for the above-mentioned groove formation process to include carrying out exposure development of the above-mentioned insulator layer which consists of the above-mentioned photopolymer in the above-mentioned manufacturing method. If it does in this way, a slot can be formed still more easily.

[0024]In the 1st manufacturing method of a semiconductor applied device concerning this invention, the 1st terminal electrode of the above, In [when being formed by forming a mask for electrode formation of predetermined shape on this electrode layer, and etching the above-mentioned electrode layer after forming an electrode layer for forming this 1st terminal electrode] the above-mentioned groove formation process, It is preferred by etching between terminal electrodes of the above 1st using the above-mentioned mask for electrode formation to form the above-mentioned slot.

[0025]In the 1st manufacturing method of a semiconductor applied device concerning this invention, in the above-mentioned groove formation process, resist can be formed in portions

other than the above-mentioned slot, and a slot can be formed by etching this resist as a mask.

[0026]In the 1st manufacturing method of a semiconductor applied device concerning this invention, a slot can be formed by etching the 1st terminal electrode of the above as a mask in the above-mentioned groove formation process.

[0027]The 2nd manufacturing method of a semiconductor applied device which requires this invention for this invention, The 2nd substrate that has two or more 2nd terminal electrodes formed so that it might correspond to the 1st substrate and 1st terminal electrode of the above that have two or more 1st terminal electrodes, A manufacturing method of a semiconductor applied device including a process which the 1st terminal electrode of the above and the 2nd terminal electrode of the above are made to counter via an anisotropic conducting film, and is joined is characterized by comprising:

A protection film formation process which forms a protective film which continued between terminal electrodes of this above 1st on a terminal conductor of the above 1st.

A resist formation process of forming resist of predetermined shape which has the 1st opening on a terminal electrode of the above 1st, and has the 2nd opening between terminal electrodes of the above 1st on the above-mentioned protective film.

An etching process which forms a contact hole on a terminal electrode of the above 1st, removes the above-mentioned protective film via the 2nd opening of the above, and forms a slot between terminal electrodes of the above 1st by removing the above-mentioned protective film via the 1st opening of the above.

If it does in this way, a semiconductor applied device with which a slot was formed between the 1st terminal electrode of the above that adjoins mutually in the 1st substrate of the above can be manufactured without newly adding a groove formation process.

[0028]In the 2nd manufacturing method of a semiconductor applied device concerning this invention. It is preferred to connect the 1st terminal electrode of the above and the 2nd terminal electrode of the above via this anisotropic conducting film in the 1st substrate of the above including a process of providing an anisotropic conducting film which followed the 1st terminal electrode of the above and above-mentioned Mizogami, furthermore.

[0029]The 2nd manufacturing method of a semiconductor applied device concerning this invention, In the above-mentioned manufacturing method, it is still more preferred to include a process of forming a resin layer which has the substantially same size as electric conduction particles contained in the above-mentioned anisotropic conducting film, and contains a non-conducting spacer particle in a portion in which the above-mentioned anisotropic conducting film is not formed.

[0030]

[Embodiment of the Invention]Hereafter, the embodiment which starts this invention with

reference to drawings is described.

Embodiment 1 concerning embodiment 1. this invention is a liquid crystal display which combines the liquid crystal display panel and driving circuit substrate of a 12.1SVGATFT liquid crystal, for example, and is constituted as follows. As a liquid crystal display panel is constituted using the glass substrate 1 and this Embodiment 1 is shown in drawing 1 at the periphery of the glass substrate 1, For example, the terminal electrode 2 which consists of an ITO film about 100 nm thick is formed, and the wiring 3 of the gate and sauce which comprise Cr, aluminum, Mo, etc. is connected to this terminal electrode 2. The protective film 4 which becomes the wiring 3 top and a picture element transistor part from a silicon nitride film etc. is formed in the thickness which is about 400 nm, and the protective film 4 is removed on the terminal electrode 2. The liquid crystal 7 is poured in between the light filter 6 and the glass substrate 1 in which the seal was carried out by the sealing compound 5. As for the 1000 total numbers of the number of some, the terminal electrode 2 is formed as 600 pieces and an object for other signal terminals as 2400 pieces and an object for gate terminals as an object for source terminals, for example.

[0031]The driving circuit substrate connected to the terminal electrode 2 of this liquid crystal panel is manufactured as follows. First, on the glass substrate 8, as shown in drawing 2 (a), CMOS circuit 9 is formed in a low-temperature-polysilicon TFT formation process. After forming CMOS circuit 9, as shown in drawing 2 (b), a silicon nitride film, After forming the contact hole 10a in the insulator layer 10 which consists of cascade screens, such as a SiO_2 film, The bilayer film of lower layer Cr100nm and 400 nm of upper aluminum system alloys is formed by sputtering on the insulator layer 10, and 11 s of source electrodes, the drain electrode 11d, and the wiring 11 and the terminal electrode 12 are simultaneously formed by one by patterning. Near the terminal area of the driving circuit substrate produced as mentioned above comes to be shown in the top view of drawing 3. As for the pitch of the terminal electrode 12, in this driving circuit substrate, the interval between 80 micrometers and the terminal electrode 12 is set as 30 micrometers.

[0032]Next, by forming in a thickness of about 400 nm the protective film 13 which consists of silicon nitride films etc., forming resist on it, in order to protect the wiring 11 etc., and patterning after shape as shows drawing 4 this resist, The resist 14 by which pattern NINGU was carried out is formed in the predetermined shape of having the rectangular openings 14a and 14b between the terminal electrodes 12 which adjoin the terminal electrode 12 top, respectively. That is, in the resist 14, as shown in some [about the A-A' line of drawing 5 (a)] sectional views, the grooved opening (extracting pattern) 14b about 20 micrometers wide is formed on the terminal electrode 12 between the opening 14a for contact formation (extracting pattern), and the terminal electrode 12.

[0033]And it etches by using resist 14 as a mask using the etching reagent containing fluoric

acid. By this etching, on the terminal electrode 12, the protective film 13 which consists of silicon nitride films via the opening 14a is removed, and between the terminal electrodes 12, the protective film 13 and the insulator layer 10 are removed, and it etches to the middle of the glass substrate 1 further. Here, etching time is set up etch a glass substrate into the depth about 20 micrometers deep. Although the protective film 13 is removed via the opening 14a on the terminal electrode 12, the terminal electrode 12 is not removed depending on an above-mentioned etching reagent, and etching does not follow it any more. In other words, the above-mentioned etching reagent needs to choose what does not etch the terminal electrode 12.
[0034]Thus, as shown in drawing 5 (b), the protective film 13 on the terminal electrode 12 can be removed, can expose the surface of the terminal electrode 12, and can form the slot 15 about 20 micrometers deep between the terminal electrodes 12 which adjoin simultaneously. Drawing 5 (a) and (b) shows a part of section about the A-A' line of drawing 4. Arrange the liquid crystal panel and driving circuit substrate which were produced as mentioned above on a terminal electrode so that the slot 15 top may be crossed for the band-like anisotropic conducting film 16, as shown in drawing 6 (a), and the terminal electrode 2 of a liquid crystal panel and the terminal electrode 12 of a driving circuit substrate are made to counter via the anisotropic conducting film 16, and it joins. Here, as the electric conduction particles 17 contained in the anisotropic conducting film 16, a thing 2-3 micrometers in diameter was used. When it does in this way, as shown in drawing 6 (b), the terminal electrode 2 of a liquid crystal panel, and the terminal electrode 12 of a driving circuit substrate, When it flows and the slot 15 is formed between the adjoining terminal electrodes 2 (adjoining terminal electrode 12) of the electric conduction particles 17 contained in the anisotropic conducting film 16, the state where the electric conduction particles 17 in the anisotropic conducting film 16 separate mutually, and exist can be maintained, and a good insulating state can be held.
[0035]When the ratio of the area which the terminal area to the size of a driving circuit substrate occupies when it mounts a driving circuit substrate in a liquid crystal panel is large, it can paste together only with the anisotropic conducting film 16 of a terminal area, and intensity can be obtained. Therefore, he is trying to paste a liquid crystal panel and a driving circuit substrate together only by a terminal area at this Embodiment 1. However, there is usually no area of a terminal area so greatly compared with a driving circuit substrate in many cases, as shown in the sectional view of drawing 7. Therefore, sufficient pasting intensity can be obtained by being stuck also to portions other than a terminal area by pressure on both sides of the resin 28 containing a spacer in such a case. Thus, when using resin containing a spacer, by adjusting the path of a spacer particle and the electric conduction particles 17, it is possible to also maintain the parallelism between substrates and generating with poor mounting by a terminal area can be suppressed.
[0036]The liquid crystal display of Embodiment 1 manufactured as mentioned above, Since the

sufficiently large slot 15 is formed between the terminal electrodes 12 which adjoin in a driving circuit substrate as compared with the path of the electric conduction particles 17 contained in the anisotropic conducting film 16, Even when a terminal is dramatically made into a narrow pitch, mounting between glass substrates (between a liquid crystal panel and a driving circuit substrate) is attained without generating the short circuit between terminals. Namely, although mounted in this Embodiment 1 using the anisotropic conducting film, Since the slot 15 is between terminal electrodes, anisotropy electric conduction resin is able to escape into the slot 15 moderately, and between the terminal electrode 12 and the terminal electrode 2, the electric conduction particles 17 in the anisotropic conducting film 16 can change, and can obtain the flow between terminal electrodes normally. A good insulation is held between adjoining terminal electrodes, without the conductor particles 17 contacting in the anisotropic conducting film 16.

[0037]Therefore, in the liquid crystal display of this Embodiment 1. In order to make connection between wiring density and a high-density terminal, it can perform easily that the interval between terminal electrodes shall be 50 micrometers or less, and can perform easily forming semiconductor applied devices, such as a display which has the 1st terminal electrode of the above 100 or more, small in the liquid crystal display of this Embodiment 1. Therefore, this invention can constitute not only a liquid crystal display but the semiconductor applied device which needs connection between the terminal electrodes formed very with high density.

[0038]In this Embodiment 1, since the width of the slot 15 and the depth are set to about 20 micrometers very greatly compared with the conductor particle diameter of 2-3 micrometers in the anisotropic conducting film 16, very good insulation can be held between adjoining conducting terminals. However, electric conduction particle diameter and the width of the slot 15, and the depth are not limited to an above-mentioned numerical value, and what is necessary is just to set them as the flute width that the conductor particles of an anisotropic conducting film do not contact between adjoining terminal electrodes, and the depth, by forming the slot 15 at least in this invention. Specifically, it is preferred that a flute width also sets up a channel depth more than the twice of electric conduction particle diameter in more than electric conduction particle diameter. That is, an anisotropic conducting film is connected by the electric conduction particles containing between the terminal electrodes located up and down, and electric conduction particles are distributed in the film so that a transverse direction may not be contacted. Therefore, by making a tooth depth more than electric conduction particle diameter, the electric conduction particles located in a part for a slot do not change, and it does not contact among the electric conduction particles which adjoin a transverse direction. It does not contact by setting up a flute width more than the twice of particle diameter among the electric conduction particles which are located in a part for a slot and adjoin a transverse direction. The sectional shape of the slot 15 does not have the necessity of being a

rectangle, either, and can be made into various shape, such as semicircular shapes or V shape.

[0039]In the liquid crystal display of this Embodiment 1, when the depth and width of the slot 15 shall be not less than 5 micrometers, there are the following advantages. Namely, if the depth and width of the slot 15 shall be not less than 5 micrometers when a 2-3-micrometer electric conduction particle is usually contained in the anisotropic conducting film generally used and the anisotropic conducting film is used, The insulating property of the anisotropic conducting film located between the terminal electrodes which adjoin mutually for the reason mentioned above can be held good. Therefore, without using a special thing as an anisotropic conducting film, that by which normal use is carried out can be used and it can manufacture cheaply.

[0040]As for the thickness of a terminal electrode, in this Embodiment 1, it is preferred to set it as 1 micrometer or less. if it does in this way -- the field of the thickness of a terminal electrode -- internal division -- cloth can be made comparatively small and the height of the surface of a terminal electrode can be mostly arranged in a substrate. Since power can be uniformly applied to electric conduction particles by this at the time of junction, defective continuity's generating can be suppressed. In this Embodiment 1, although the variation which a substrate becomes large or becomes may produce the depth of the slot 15, a problem is not produced at all on mounting by expecting the variation and setting it as the above depth to some extent. Therefore, even if the thickness of a driving circuit substrate is thick, it is possible for it to be satisfactory and to mount, and a comparatively large substrate can also be used as a driving circuit substrate. In this Embodiment 1, since patterning of the slot 15 is performed simultaneously with patterning of a protective film, it does not newly increase a photoengraving process, and it does not become pushing up a manufacturing cost.

[0041]In the manufacturing method of the liquid crystal display of this Embodiment 1, since a vamp is not formed in each one terminal electrode of every like the bump formation by wire BONTA, also when there are very many terminal electrodes, a process can be simplified, and it can manufacture by low cost. Although wet etching was used as etching when forming the slot 15 in this Embodiment 1, it adopts in consideration of a throughput and apparatus cost, and this invention is not limited to this and may use dry etching.

[0042]In this Embodiment 1, also when the width of a terminal electrode and the interval between terminal electrodes are still narrower as compared with a conventional example, it can apply. If it is necessary to etch by highly precise width, it is preferred to use dry etching with little side etching. If the anisotropic etching in RIE mode is used also in dry etching, high-precision processing will be attained, and production of a liquid crystal display with still narrower the width of a terminal electrode and the interval between terminal electrodes is possible. According to this Embodiment 1, the slot 15 was formed in the driving circuit

substrate side in the process of manufacturing the low-temperature-polysilicon drive circuit on a glass substrate with many chip picking per substrate. by this, cost increase Kuwae per unit chip becomes empty compared with the case where take and the slot 15 is established in comparatively few liquid crystal panel side of a number -- it can do that there is nothing. However, this invention is not restricted to this and it may be made to form a slot between the terminal electrodes by the side of a liquid crystal panel substrate.

[0043]Although the slot 15 was formed by etching to the middle of the glass substrate 1 in the liquid crystal display of Embodiment 1, When the insulator layer 10 is formed comparatively thickly (1 micrometers or more), it may be made to form a slot by etched and removing only the insulator layer 10 located between terminal electrodes. If it does in this way, a slot can be formed comparatively easily and insulation between terminal electrodes can be made good. If the insulator layer 10 is formed with a photopolymer in this case and a slot is formed by carrying out exposure development of the insulator layer 10 which consists of that photopolymer, a slot can be formed still more easily.

[0044]As mentioned above, the high density assembly between the rigid bodies (a glass substrate and a driving circuit substrate) by an anisotropic conducting film of the liquid crystal display of this Embodiment 1 becomes possible by forming a slot between the terminal electrodes of a driving circuit substrate at high yield. Since a slot can be formed simultaneously with the phototype process at the time of removal of the protective film of a driving circuit substrate, and it can form, without newly increasing a photoengraving process, a manufacturing cost is not raised. Even if a terminal number increases, a manufacturing cost is not made to increase, since it can process simultaneously to all the terminal electrodes. Since it can mount without packing IC, cost can be lowered as compared with the case where IC is packed individually. Since what has not packed separately can be used as a semiconductor device, the area which a semiconductor device occupies can be reduced and it becomes possible to miniaturize dramatically and to slim down a semiconductor applied device.

[0045]The liquid crystal display of Embodiment 2 concerning this invention which consists of embodiment 2., next the liquid crystal panel and driving circuit substrate of TFT liquid crystal is explained. Unlike the driving circuit substrate of Embodiment 1, in the liquid crystal display of this Embodiment 2, the driving circuit substrate uses what has a liquid crystal panel [be / the same as that of Embodiment 1 / it]. The driving circuit substrate used by Embodiment 2 is constituted like the driving circuit substrate of Embodiment 1 except having replaced with the glass substrate 8 in the driving circuit substrate of Embodiment 1, and having used the silicon substrate 18.

[0046]Namely, in Embodiment 2 a driving circuit substrate, As shown in drawing 8 (a), CMOS circuit 29 is formed in the silicon substrate 18 of a single crystal in the usual MOS transistor formation process, and as shown in drawing 8 (b) and drawing 9, it produces like the

manufacturing method of the driving circuit substrate of Embodiment 1 hereafter to it. The silicon substrate 18 used for the driving circuit substrate of this Embodiment 2, It can etch by using properly the etching reagent containing fluoric acid and the etching reagent which contains fluoric acid and nitric acid to a silicon substrate to the surface protective film 13 and the insulator layer 10 like the glass substrate 8 used for the embodiment.
[0047]In the manufacturing method of the liquid crystal panel device of Embodiment 2. Like the case of Embodiment 1, as the driving circuit substrate and liquid crystal panel which were produced as mentioned above using the silicon substrate 18 are shown in drawing 10 (a) and drawing 10 (b), it inserts between the terminal 2 and the terminal 12, and mounts by thermo compression bonding so that the anisotropic conducting film 16 fang furrow 15 may certainly be crossed.
[0048]The liquid crystal display of Embodiment 2 produced as mentioned above, It has the same operation effect as Embodiment 1, and the highly efficient driving circuit substrate which consists of semiconductor IC chips further is used, and processes, such as bump formation to the package and terminal like the usual semiconductor device, are required, and large low-cost-izing of a drive IC part is possible by there being nothing.
[0049]The liquid crystal display of the embodiment 3. book embodiment 3 joining the liquid crystal panel and driving circuit substrate of TFT liquid crystal, and having prevented the short circuit between the terminals which form a slot and adjoin between the terminals by the side of a liquid crystal panel differ in Embodiments 1 and 2. Common liquid crystal panels, such as 12.1SVGA, can be used for the liquid crystal panel in this Embodiment 3, for example.
[0050]Hereafter, the manufacturing method of the liquid crystal display of this Embodiment 3 is explained.
(Production of a liquid crystal panel) By this method, first, as shown in drawing 12, in accordance with the manufacturing method of the usual amorphous TFT, the picture display part 19 is formed on the glass substrate 1. After forming an ITO film about 100 nm thick so that it may be connected to the wiring 3 of the gate and sauce which comprise Cr, aluminum, Mo, etc. on the gate dielectric film 20 of TFT as a terminal part, the terminal electrode 2 and the picture element electrode 21 are simultaneously formed in predetermined shape by carrying out pattern NINGU. Next, in order to protect the wiring 3, a picture element transistor part, etc., the protective film 4 which consists of a silicon nitride film about 400 nm thick etc. is formed. In a liquid crystal panel, a terminal electrode pitch and the distance between terminal electrodes are 80 micrometers and 30 micrometers, respectively, as shown in drawing 13.
[0051]Next, the resist 14 by which pattern NINGU was carried out is formed in the predetermined shape of having a rectangular opening between the terminal electrodes 2 which adjoin the terminal electrode 2 top, respectively, by forming resist on the protective film 4 and patterning after shape as shows drawing 14 this resist. Namely, in the resist 14, as shown in

some [in the section about the B-B' line of drawing 14 and drawing 14] sectional views (drawing 15 (a)), The grooved opening (extracting pattern) 14b about 20 micrometers wide is formed on the terminal electrode 2 between the opening 14a for contact formation (extracting pattern), and the terminal electrode 12.

[0052]And it etches by using resist 14 as a mask using the etching reagent containing fluoric acid. By this etching, on the terminal electrode 2, the protective film 4 which consists of silicon nitride films via the opening 14a is removed, and between the terminal electrodes 2, the protective film 4 and the insulator layer 20 are removed, and it etches to the middle of the glass substrate 1 further. Here, etching time is set up etch a glass substrate into the depth about 20 micrometers deep.

[0053]Next, as shown in drawing 16, the glass substrate 1 and the light filter 6 perform a cell group on both sides of the sealing compound 5 like the manufacturing method of the usual liquid crystal panel, the liquid crystal 7 is poured in, and a liquid crystal panel is completed. Although the liquid crystal panel in which form of source wiring and the picture element electrode 21 was held in the same layer was used in this Embodiment 3, the method which formed about 3 micrometers of photosensitive organic resin films etc., and carried out flattening, and also formed the picture element electrode 21 and the terminal 3 in the top layer can also be used.

[0054](Production of a driving circuit substrate), next the manufacturing process of the driving circuit substrate joined to this liquid crystal panel are explained referring to drawings. In the manufacturing method of the driving circuit substrate of Embodiment 3. The lower layer which forms CMOS circuit 9 in a low-temperature-polysilicon TFT formation process on the glass substrate 8, and consists of a 100-nm-thick Cr layer on the insulator layer 10 like Embodiment 1 as shown in drawing 17 (a), A bilayer film with the upper layer which consists of a 400-nm-thick aluminum system alloy is formed by sputtering, and it forms by patterning a source drain electrode, the wiring 11, and the terminal electrode 12. And after forming about 400 nm of protective films which consist of silicon nitride films etc. in order to protect wiring etc. as shown in drawing 17 (b), the protective film 13 is formed by carrying out pattern NINGU so that the opening 13a may be formed on the terminal electrode 12. As each terminal electrode 12 is shown in drawing 18, a terminal pitch is formed so that 80 micrometers and the distance between terminals may be set to 30 micrometers.

[0055](Junction to a liquid crystal panel and a driving circuit substrate) As shown in drawing 19 (a), the liquid crystal panel and driving circuit substrate which were produced as mentioned above, Arrange the band-like anisotropic conducting film 16 so that the slot 15 top may be crossed, and the terminal electrode 2 of a liquid crystal panel and the terminal electrode 12 of a driving circuit substrate are made to counter via the anisotropic conducting film 16, and it joins. Here, as the electric conduction particles 17 contained in the anisotropic conducting film

16, a thing 2-3 micrometers in diameter was used. When it does in this way, as shown in drawing 19 (b), the terminal electrode 2 of a liquid crystal panel, and the terminal electrode 12 of a driving circuit substrate, When it flows and the slot 15 is formed between the adjoining terminal electrodes 2 (adjoining terminal electrode 12) of the electric conduction particles 17 contained in the anisotropic conducting film 16, the electric conduction particles 17 in the anisotropic conducting film 16 can separate mutually, can make it exist, and can hold a good insulating state.

[0056]Sufficient pasting intensity can be obtained by sticking this Embodiment 3 as well as Embodiment 1 also to portions other than a terminal area by pressure on both sides of resin containing a spacer. Poor mounting in a terminal area can be made hard it to be possible to also maintain the parallelism between substrates by adjusting the path of a spacer particle and the electric conduction particles 17, and to generate.

[0057]Like Embodiment 1, when a terminal electrode is made into a narrow pitch, without generating a short circuit between adjoining terminal electrodes, junction between glass substrates is possible for it, and the miniaturization of the liquid crystal display of Embodiment 3 produced as mentioned above is possible. the bump formation according [on the case where the number of terminals is increased, and] to a wire bonder -- like -- even [terminal] -- every -- since it is not necessary to process, a process can be made very simple and it can manufacture by low cost.

[0058]According to this embodiment, although the low temperature polysilicon TFT on a glass substrate was mounted in the driving circuit substrate, since the liquid crystal panel side is processed, even if it creates and mounts the substrate which does not form the slot 15 in the drive circuit on the silicon substrate of Embodiment 2, it can mount similarly. Naturally, the same effect is acquired even if it forms the slot 15 in both a driving circuit substrate and a liquid crystal panel. Also in this Embodiment 3, dry etching may be used for the slot 15 like Embodiment 1.

[0059]In the embodiment 4. embodiments 1, 2, and 3, after carrying out pattern NINGU of the protective film 13 on a terminal electrode, the slot 15 was formed using the resist 14 used for the pattern NINGU, but also when using the liquid crystal panel or driving circuit substrate which does not form a protective film on a terminal electrode, naturally it is. This Embodiment 4 shows an example of the groove formation when not forming the protective film 13 on a terminal electrode.

[0060]That is, in this Embodiment 4, after forming the insulator layer 10 which consists of two or more layers on the glass substrate 1, the conductor layer for forming the terminal electrode 42 on this insulator layer 10 is formed. And the terminal electrode 44 of specified shape is formed by forming the resist 44 on this conductor layer at predetermined shape, and etching a conductor layer by using this resist 44 as a mask, as shown in drawing 20 (a). Next, as shown

in drawing 20 (b), the resist 44 is removed, and the slot 45 is formed by etching the insulator layer 10 and the glass substrate 1 by using the terminal electrode 42 as a mask, as shown in drawing 20 (c). Before removing the resist 44, it may be made to form the slot 45 by etching by using the resist 44 and the terminal electrode 42 as a mask in this invention.

[0061]It is preferred that near a terminal electrode is immersed in an etching reagent, and forms the slot 15 between terminals by the etching process in the case of forming the slot 15 here. If it does in this way, when forming the slot 15 in the liquid crystal panel side, after performing a cell group in a liquid crystal panel, etching for groove formation can be performed. As the liquid crystal panel and driving circuit substrate which were produced as mentioned above are shown in drawing 21 (a) and drawing 21 (b) like Embodiments 1, 2, and 3, it inserts between the terminal electrode 42 and the terminal electrode 12, and mounts by thermo compression bonding so that the anisotropic conducting film fang furrow 15 may certainly be crossed. In the method of this Embodiment 4, as shown in drawing 21 (a), all slot 45 comrades will be connected, but as shown in drawing 21 (b), the same operation effect as Embodiments 1-3 is obtained.

[0062]Since resist or terminal electrode 42 itself when forming the terminal electrode 42 is used as a mask when forming the slot 15, the photoengraving process patterned for forming the slot 15 is not newly added. Therefore, also in the point of not raising a manufacturing cost, it is the same as that of Embodiments 1-3.

[0063]Although each formed the slot only in a liquid crystal panel, a driving circuit substrate, and either in Embodiments 1-4 described above, this invention is not restricted to this but it may be made to form a slot in a liquid crystal panel and the both sides of a driving circuit substrate. If it does in this way, the same effect can be acquired even if it makes comparatively respectively shallow the tooth depth formed in a panel and a substrate.

[0064]According to above Embodiments 1-4, although each was explained about the liquid crystal display, this invention is not restricted to this. That is, this invention can be applied to the semiconductor applied device which has the composition which pastes together at least two substrates which have two or more terminal electrodes, respectively, and connects between terminal electrodes mutually, and has the same operation effect as Embodiments 1-4.

[0065]In Embodiments 2-3, it cannot be overemphasized that the various modification explained by Embodiment 1 is possible.

[0066]

[Effect of the Invention]As explained to details above, the semiconductor applied device concerning this invention, In [about the 1st substrate that has two or more 1st terminal electrodes and the 2nd substrate that has two or more 2nd terminal electrodes, it is joined and become so that the 1st terminal electrode of the above and the 2nd terminal electrode of the

above may counter via an anisotropic conducting film and] the 1st substrate of the above, The slot is formed between the 1st terminal electrode of the above, respectively. Since the interval of the 1st substrate of the above and the 2nd substrate of the above in a part for the slot between the 1st terminal electrode of the above can be enlarged by this, the insulating property of the above-mentioned anisotropic conducting film located between the 1st terminal electrode of the above can be held good, and since it becomes possible to narrow between terminal electrodes, it is made to small size. By etching into a part for the slot which should be formed, for example by forming the resist which has an opening, the above-mentioned slot can be formed at once, and it is a high throughput and it can manufacture many slots cheaply.
[0067]In the semiconductor applied device concerning this invention, the interval between the terminal electrodes of the above 1st can be 50 micrometers or less, and, thereby, it is made to collapsibility small size that connection between wiring density and a high-density terminal is possible.
[0068]A small and large-scale circuit can consist of semiconductor applied devices concerning this invention by making the terminal number of the 1st terminal electrode of the above or more into 100.
[0069]Since variation in the thickness of a terminal electrode can be made small in the semiconductor applied device concerning this invention by the thickness of the 1st and 2nd terminal electrodes of the above being 1 micrometer or less, respectively, A flow with the 1st terminal electrode of the above and the 2nd terminal electrode of the above can be made good, and a good insulating property is acquired between the terminal electrodes of the above 1st, and between the terminal electrodes of the above 2nd. Since a terminal electrode is made into a thin shape, slimming down of a semiconductor applied device is attained.
[0070]By making the above-mentioned tooth depth larger than the path of the electric conduction particles contained in the above-mentioned anisotropic conducting film in the semiconductor applied device concerning this invention, and making width of the above-mentioned slot into more than twice the above-mentioned electric conduction particle diameter, Since the insulating property of the above-mentioned anisotropic conducting film located between the 1st terminal electrode of the above that adjoins mutually (the 2nd inter-electrode of the above that adjoins mutually) can be held more to fitness, it becomes possible to make the interval between terminal electrodes still narrower, and much more miniaturization is attained.
[0071]In the semiconductor applied device concerning this invention, since the anisotropic conducting film in which the 2-3-micrometer electric conduction particle generally used by the above-mentioned tooth depth and width being not less than 5 micrometers is contained can be used, a general-purpose anisotropic conducting film can be used and it can do cheaply.
[0072]In the semiconductor applied device concerning this invention, it can do with displays,

such as a liquid crystal display panel, by using at least one side of the 1st or 2nd substrate of the above as a transparent insulating substrate.
[0073]In the semiconductor applied device concerning this invention, In the portion which the 1st substrate of the above and the 2nd substrate of the above counter, into and the portion in which the above-mentioned anisotropic conducting film is not formed. Since the 1st substrate of the above and the 2nd substrate of each other of the above can be substantially made parallel by forming the resin layer which has the substantially same size as the electric conduction particles contained in the above-mentioned anisotropic conducting film, and contains a non-conducting spacer, A flow with the 1st terminal electrode of the above and the 2nd terminal electrode of the above can be made good, and a good insulating property is acquired between the terminal electrodes of the above 1st, and between the terminal electrodes of the above 2nd.
[0074]When the 1st terminal electrode of the above is formed on the substrate of the above 1st in the semiconductor applied device concerning this invention via the insulator layer which has a thickness of 1 micrometers or more, By forming by removing the insulator layer located between the 1st terminal electrode of the above in the above-mentioned slot, since formation of a slot can be performed comparatively easily, it can do cheaply.
[0075]In the semiconductor applied device concerning this invention, since integration of a circuit can be easily performed by using either as a silicon substrate among the above 1st and the 2nd substrate, a highly efficient and small circuit can be formed.
[0076]The 1st manufacturing method of the semiconductor applied device concerning this invention, It is a manufacturing method including the joining process which makes the above 1st and the 2nd terminal electrode counter via an anisotropic conducting film, and joins the 1st substrate of the above, and the 2nd substrate of the above, The small thin semiconductor applied device with which the slot was formed between the 1st terminal electrode of the above that adjoins mutually in the 1st substrate of the above before the above-mentioned joining process since the groove formation process of forming a slot between the 1st terminal electrode of the above in the 1st substrate of the above is included can be manufactured.
[0077]In the 1st manufacturing method of the semiconductor applied device concerning this invention, the 1st substrate of the above with the substrate which consists of glass, quartz, or silicon to a ** case. When the above-mentioned groove formation process includes the etching process which etches the 1st substrate of the above using the solution containing fluoric acid, a slot can be formed easily and a manufacturing cost can be made cheap.
[0078]When the 1st substrate of the above is a substrate which consists of glass, quartz, or silicon, it may be made for the above-mentioned groove formation process to form the above-mentioned slot in the 1st manufacturing method of the semiconductor applied device concerning this invention including the process of etching the 1st substrate of the above by dry

etching. Since the slot of predetermined shape can be formed with sufficient accuracy if it does in this way, the semiconductor applied device which has a better insulating property between adjoining terminal electrodes can be manufactured.
[0079]When the 1st terminal electrode of the above is formed in the 1st manufacturing method of the semiconductor applied device concerning this invention via the insulator layer which has a thickness of 1 micrometers or more on the substrate of the above 1st, Since a slot can be formed comparatively easily when the above-mentioned groove formation process considers it as the process of forming a slot by etching and removing the above-mentioned insulator layer located between the terminal electrodes of the above 1st, a manufacturing cost can be made cheap.
[0080]In the above-mentioned manufacturing method, since a slot can be formed still more easily by the above-mentioned insulator layer forming with a photopolymer, and making it include that the above-mentioned groove formation process carries out exposure development of the above-mentioned insulator layer which consists of the above-mentioned photopolymer, a manufacturing cost can be made cheap more.
[0081]In the 1st manufacturing method of the semiconductor applied device concerning this invention, the 1st terminal electrode of the above, If it forms by forming and etching the mask for electrode formation of predetermined shape and the above-mentioned slot is formed by etching between the terminal electrodes of the above 1st using the above-mentioned mask for electrode formation after forming an electrode layer, Since it is not necessary to form the mask for groove formation independently, a manufacturing cost can be made cheap.
[0082]In the 1st manufacturing method of the semiconductor applied device concerning this invention, in the above-mentioned groove formation process, resist can be formed in portions other than the above-mentioned slot, and a slot can be easily formed by forming a slot by etching this resist as a mask.
[0083]In the 1st manufacturing method of the semiconductor applied device concerning this invention, in the above-mentioned groove formation process, since a manufacturing process can be simplified by forming a slot by etching the 1st terminal electrode of the above as a mask, a manufacturing cost can be made cheap.
[0084]The 2nd manufacturing method of the semiconductor applied device concerning this invention, Are the process of making the 1st terminal electrode of the above, and the 2nd terminal electrode of the above countering via an anisotropic conducting film, and joining the 1st substrate of the above, and the 2nd substrate of the above a manufacturing method of the included semiconductor applied device, and The above-mentioned protection film formation process, Since the above-mentioned resist formation process and the above-mentioned etching process are included, the semiconductor applied device with which the slot was formed between the 1st terminal electrode of the above that adjoins mutually in the 1st substrate of the

above can be manufactured without newly adding a groove formation process, and can be manufactured cheaply.

[0085]In the 2nd manufacturing method of the semiconductor applied device concerning this invention. Furthermore in the 1st substrate of the above, including the process of providing the anisotropic conducting film which followed the 1st terminal electrode of the above, and above-mentioned Mizogami, by connecting the 1st terminal electrode of the above, and the 2nd terminal electrode of the above via this anisotropic conducting film, The semiconductor applied device which can hold the insulating property of the above-mentioned anisotropic conducting film located between the 1st terminal electrode of the above good can be manufactured.

[0086]The 2nd manufacturing method of the semiconductor applied device concerning this invention, In the above-mentioned manufacturing method, further by including the process of forming the resin layer containing the above-mentioned spacer particle in the portion in which the above-mentioned anisotropic conducting film is not formed, The flow between the 1st terminal electrode of the above and the 2nd terminal electrode of the above is good, and can manufacture the better city semiconductor applied device of the insulating property between the terminal electrodes of the above 1st, and between the terminal electrodes of the above 2nd.